SWIMMING POOLS

Published by

PORTLAND CEMENT ASSOCIATION

Swimming pools on private estates are considered by many to be indispensable. The beautiful treatment of this pool, with its convenient dressing rooms and inviting loggia, makes it a place of enchantment on the estate of Asa V. Call of Los Angeles.

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PORTLAND CEMENT ASSOCIATION

A NATIONAL ORGANIZATION TO IMPROVE AND EXTEND THE USES OF CONCRETE

33 WEST GRAND AVENUE

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July 11, 1930

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To Architects:

Municipalities, commercial organizations, clubs, hotels and apartment promotors, and private individuals are alive to the necessity and desirability of having properly designed and constructed swimming pools which are safe and sanitary. Pools are being built in every community in increasing numbers. Public parks and private estates are not considered complete without a modern swimming pool. Hotel guests and tenants in the better apartments are insisting on having swimming facilities available throughout the year.

Indoor and outdoor pools must be properly designed and constructed. Strong, durable, watertight concrete is essential to such construction. Through proper control of the quantity of water used in the concrete as well as the quality and proportions of the aggregates, concrete possessing these characteristics can be made.

Faulty construction results from inattention to the basic principles for making concrete and to the incorrect handling of the various design problems. The enclosed booklet "Swimming Pools" has been prepared to assist designers and to place in their hands a source of information which will enable them to build pools which will endure and give thorough satisfaction.

We hope this booklet will be found helpful. If you should require additional copies for yourself or clients, or if you desire assistance in any problems concerning concrete, feel free to call upon us for either at no cost to yourself.

Yours very truly,

W.E.Hart

Manager,
Structural and Technical Bureau

W.E.Hart*SS

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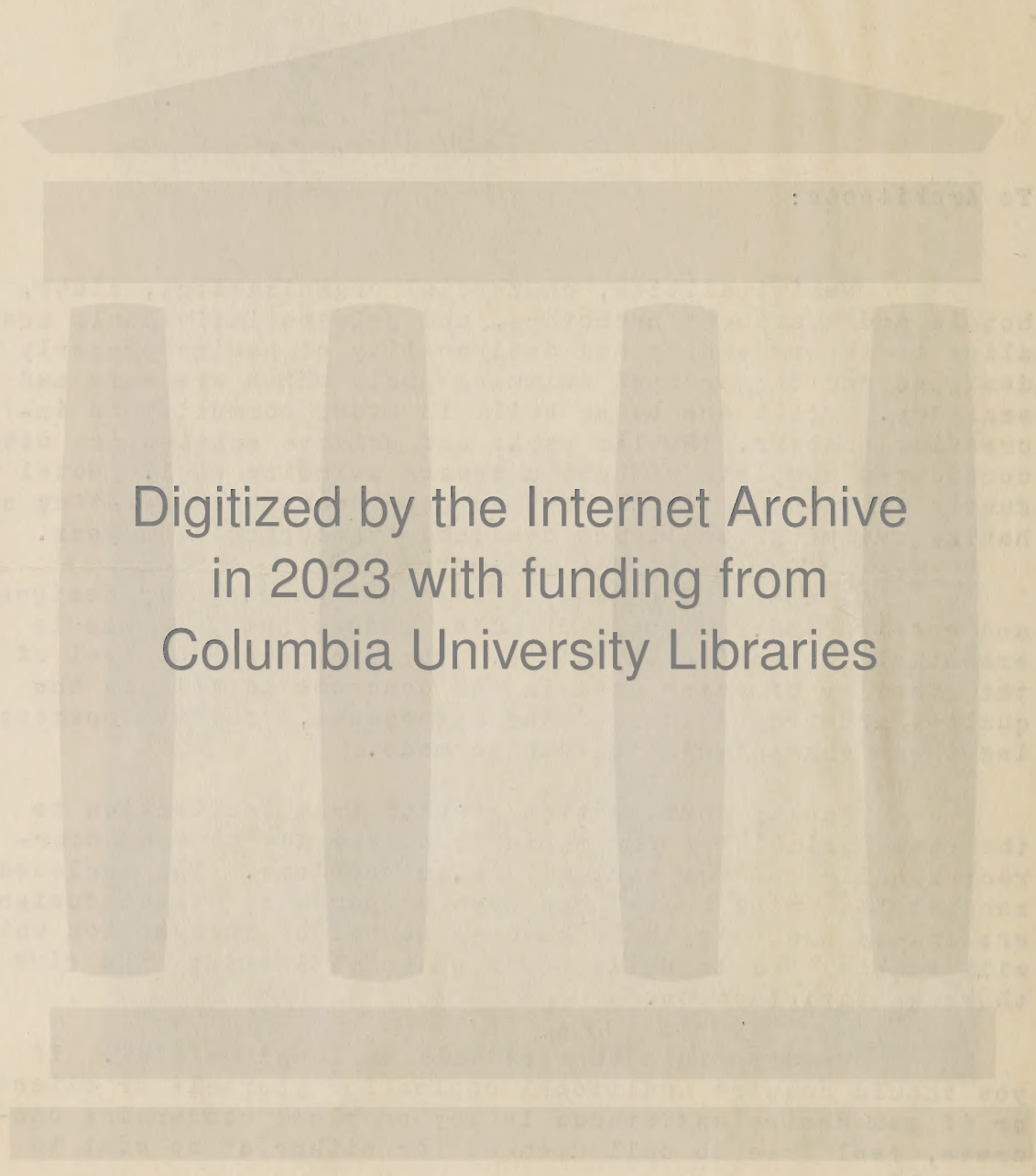

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SWIMMING POOLS

"THE Old Swimmin' Hole" lingers as a fond memory in the minds of many a grown man and stirs the fancy of youth. The dark depths of a quiet pool at the bend of the river was the favorite spot for the boys of yesterday and tempted more than one to disregard a mother's warning of the dangers which lurked there.

Cries of "first one in" and "chaw beef" mingled with other sounds of revelry, while frequently tragedy stalked the shore when some novice swimmer stepped into "that deep hole off the ledge."

Today such conditions should not be encountered. Well-designed swimming pools are taking the place of "the old swimmin' hole." The beginner as well as the expert swimmer is safe in these pools and may enjoy a refreshing swim in clean, pure water, under the watchful eyes of lifeguards and instructors.

The popularity of swimming among young and old has increased greatly during the last decade. Individuals, municipalities, clubs, civic organizations, and commercial enterprises have been impressed and are alive to the fact that a greater number of people enter into and enjoy the sport of swimming than take part in any other outdoor athletic activity. It requires only a casual observation of the bathing beaches and pools on a warm day to realize that swimming stands paramount among all forms of recreation.

The physical development of the boys and girls of the country is of utmost importance. It is universally recognized that no form of exercise is better fitted than swimming to improve the physique, to strengthen the heart and lungs, and to produce perfect coordination of the mind and muscles of the participant. The therapeutic value of this exercise is beneficial in alleviating the effects of many diseases, including infantile paralysis, and is urged by many leading physicians. On hot summer days, the invigorating effect of a cool plunge into pure water cannot be over-estimated. It restores vitality and refreshes the body for work or play.

The swimming pool may easily be the most attractive spot in a public park or private estate. Its clear, blue-green water catching the glint of the sun's rays lends a note of interest to any setting. The indoor pool in hotel, apartment or club has an equally strong appeal. The impression made on guests, tenants, and members by the glistening walls of the room, reflected in the mirror-like surface of the water, is one of practical as well as aesthetic value.

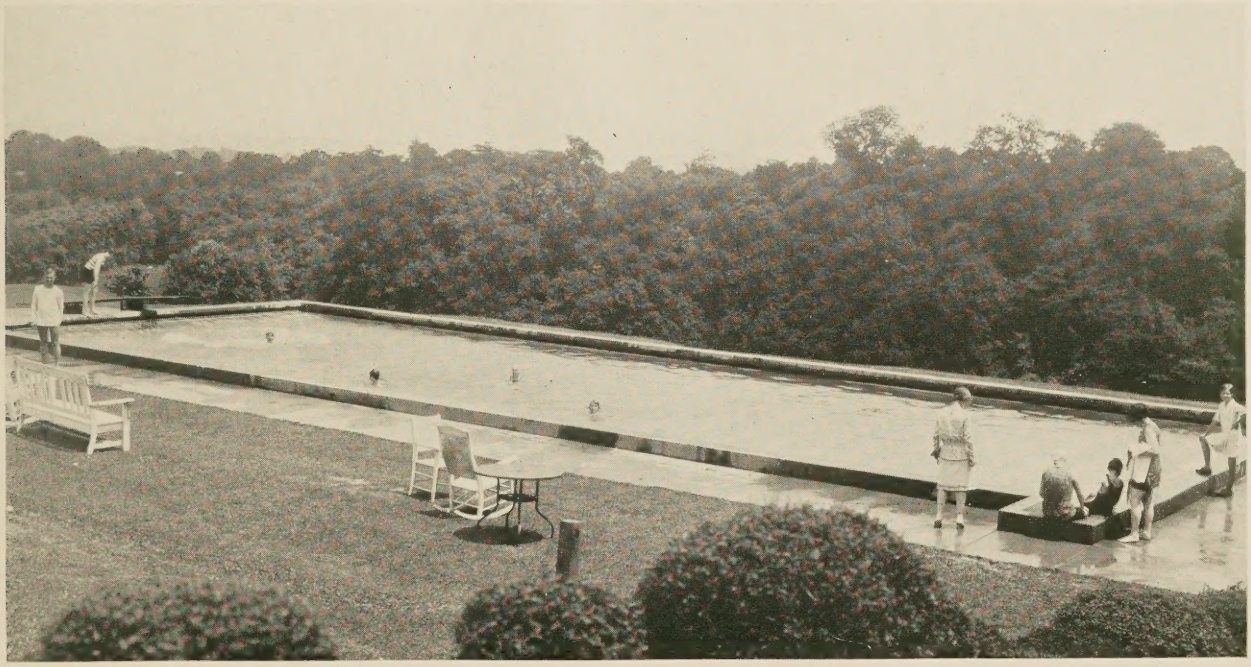


Photo from Graver Corp.

The Cincinnati Country Club chose a sylvan setting for its swimming pool.

The swimming pool of the Nassau Country Club, Glen Cove, Long Island, is located close to the clubhouse, where it is convenient for use and adds greatly to the charm of the landscape.

PUBLIC POOLS

Unfortunately, many cities and towns are not situated on a large body of water satisfactory for bathing purposes. Even where so located, the majority of people in the community live long distances from the bathing place and this beneficial sport must ordinarily be foregone or limited to only a few occasions during the season.

The need for more pools is indicated by the overcrowded condition of every place where people may go to swim. Public beaches on natural bodies of water in many of our cities are so heavily patronized that the addition of pollution to that already present becomes a serious menace to health. Public officials, civic organizations, and private enterprises will render worthwhile service to their communities by encouraging the construction of safe, sanitary, concrete swimming pools.

FINANCING OF PUBLIC POOLS

Several methods have been used to finance public swimming pools. Popular sentiment is usually so strongly in favor of the improvement that little difficulty is experienced in securing the money necessary for the construction. The operation of a properly managed pool is not a drain on the public treasury. Where necessary, a small admission charge may be made which will pay all expenses and usually return a margin of profit.

Public Funds

In the majority of larger cities, the construction and management of swimming pools is under the control of the park board. Public funds under their jurisdiction may be appropriated for the construction of pools. In other cities, the appropriation may be made from the general fund. Where funds cannot be made avail-

This privately operated swimming pool in Indian Springs, Los Angeles County, California, is equipped with every modern convenience and protects its patrons with the filtration equipment shown in the lower right-hand corner of the picture.

able by these methods, a bond issue to build swimming pools may be placed on the ballot at a general or special election.

Public Subscription

Many pools have been financed with funds obtained by public contributions. Labor, equipment, materials, and professional services, as well as cash, are frequently donated. Thus, everyone can help, and the task of raising the money necessary to build the pool is minimized.

Civic Clubs, Chambers of Commerce, and American Legion Posts throughout the country have conducted many successful campaigns for community swimming pools. In some instances, several of these organizations have combined to conduct the campaign. They have thus rendered a service to their community of inestimable value in the improvement of health of the citizens, as well as contributing much to their pleasure.

In some communities it has been possible for the local park board or legislative body to appropriate a portion of the money required to construct a pool but not enough to finance the entire project. Under such conditions, a small campaign conducted by civic clubs for public subscriptions has been sufficient to make the project a reality.

Memberships

The system of selling memberships which entitle a person to the use of the pool for a season, or for an even longer period without further charge, has also been successful in securing funds for the cost of construction. Running expenses are met from the charges to non-members using the pool.

Fees

Admission to public pools financed from public funds is frequently free, particularly for children. A

Photo from Graver Corp.

The Indianola Park Pool in Columbus, Ohio, was built in 1903 and is in daily use throughout the swimming season. The permanence of concrete construction and the negligible maintenance charges insure the maximum return on the investment.

nominal charge of five or ten cents for towel and soap and fifteen to twenty-five cents for the rental of a bathing suit is customary.

In cases where the pool has been financed by a civic organization or by selling memberships, an admission fee is generally charged to meet current expenses and in some instances to pay off the indebtedness or to reimburse original contributors. After the pool has been put on a self-supporting basis and all obligations are met, the fees are reduced to a point where they will just meet the running expenses and take care of suit replacements and similar items of expense.

TYPES OF POOLS

Whether a public pool shall be indoors or outdoors is largely a question of local conditions. In congested sections, an indoor pool will usually be the more desirable, since it will require less ground area and can be used the entire year, regardless of climatic conditions. The winter demand for swimming pool facilities even in northern parts of the country is usually about fifty per cent of the average summer demand. This amply warrants the construction of indoor pools.

Where the pool is to be located in a public park or in southern latitudes, outdoor pools will be more popular. The added benefit of the outdoor exercise is not to be ignored.

Selecting the Outdoor Site

In selecting a site for an outdoor pool, a location should be chosen where natural drainage is good. The site should be as centrally located as real estate prices, local ordinances and other conditions permit, so that it can be reached by the greatest number of people. The natural beauty and central location of public parks offer attractive sites for municipal pools. Also the necessity of acquiring land is obviated. When public land is not available and a central location is impracticable, the pool should be built near a car line or paved road as near to the city as possible.

A concrete center island such as this one in the pool at South Temple, Pennsylvania, is a desirable feature in a large public pool.

The value of attractive surroundings should be borne in mind when choosing a site. The lure of a beautiful setting will greatly increase the popularity of a pool. The cool shade cast by a few overhanging trees will be welcome on hot days.

An ample supply of water close at hand will eliminate the laying of a large supply pipe over considerable distances. Likewise, the pool should be located so that it can be drained into a stream or sewer without an excessive length of drain tile being laid.

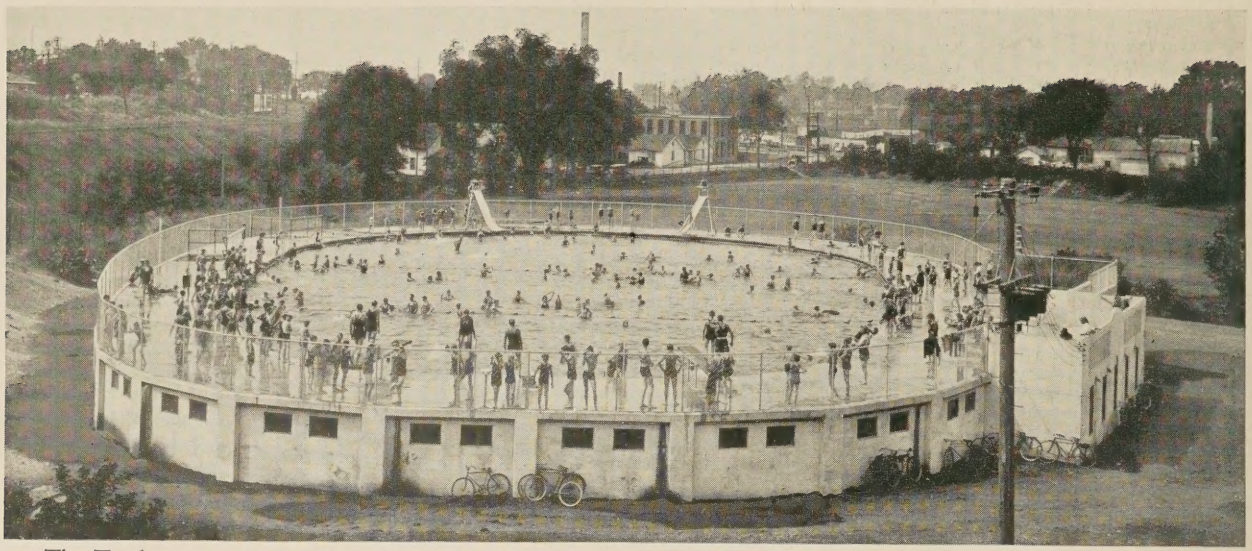
Wherever possible, the pool should be located in a porous soil such as sand or gravel which has a natural drainage. If this is not feasible, an adequate drainage system of concrete tile should be provided under the floor and around the wall footings to prevent damage by frost action.

Size of Pool

The determination of the size of a proposed pool is a very important question and should be made after careful consideration of several important factors. The pool should have sufficient area to accommodate, without undue crowding, the largest number of people who are likely to use the pool on holidays or special occasions. At the same time it must not be so large as to be wasteful of water or space under ordinary conditions, or to appear poorly patronized. The available building site and the amount of money which can be raised for the purpose will also have an important bearing on the size of the pool.

The average daily attendance, as well as the maximum demand, will have to be estimated from previous experience with pools in the community, or the experience of other cities similarly situated may be used as a guide.

In computing the area which must be provided, the pool should be divided into three zones. The divers' zone should extend about ten feet beyond the end of the diving board or tower and ten feet on either side. Not more than twelve people, including those in the water and waiting their turn to dive, should be considered as using this zone at one time.



The Tenth Avenue Pool at Rockford, Illinois, is built above ground, entirely of monolithic concrete construction.

In determining the area for swimming, approximately twenty-seven square feet should be provided for each swimmer expected to be present at the time of maximum load. This allowance takes into account the percentage of the total number who will be on the bank.

The area for non-swimmers will be somewhat dependent upon the size of the pool. In small pools, this area should be included with the swimmers' zone. For large pools, an allowance of ten square feet for each non-swimmer should be provided.

Operators of public pools advise that about 75 per cent of the area of the pool should have a depth of water of four and one-half feet or less, and the remaining 25 per cent should vary from four and one-half to about nine feet for diving. Any depth over three and one-half feet is sufficient for swimming.

Shape of Pool

Rectangular pools are somewhat simpler to build than those having curved sides and are more common. There are, however, many advantages in the circular, oval or irregular-shaped pools which will frequently warrant the slight additional cost.

The pool which fits into the landscape, taking its shape from the contour of the location, is particularly pleasing. In pools of this character and those having a circular or oval shape, the deep water for diving is usually at the center. The diving platform can be reached only by swimmers, so that there is no danger of a child unable to swim falling into the deep water from the springboard or from the walk around the pool.

Pool Layout

Careful attention should be given to the arrangement of entrances and exits of the pool in relation to the bathhouse, dressing rooms, showers, and toilets in order to facilitate inspection and routing of bathers. The entrance to the pool should be at the shallow end. Warning signs should be posted at the deep end to caution against entering the pool at that point.

Design and Construction

The side walls and bottom of the pool must be designed to withstand the water pressure from within the pool. The walls must also resist the pressure of the earth when the pool is empty. The nature of the soil on which the pool is built will influence the design materially. The illustrations of the rectangular and oval pools shown on pages 26 and 27 are intended only as typical designs. The services of a competent engineer should be employed on work of this kind to insure the correctness of design and to superintend the construction.

It is essential that a swimming pool be watertight. This can be attained with concrete which has been properly proportioned, mixed, placed and cured. Well-made concrete is dense and impervious. By adherence to the specification given on page 30 in this book, a highly satisfactory concrete will be obtained.

To prevent the possibility of cracks forming as a result of temperature changes and shrinkage, it is necessary to provide sufficient reinforcement and correctly designed expansion joints in the floor and walls of the pool. These joints should be located about every fifty

Photo from Wm. B. Scaife & Sons Co.

Floodlighting, amusement equipment, and a filtered water supply make the Urbana, Illinois, pool a popular place both night and day.

or sixty feet. Sections of floor should be such that the longest side is not more than sixty feet. A joint should also be provided where the floor of the rectangular pool abuts the walls.

Special Design Features

There should be a small curb completely surrounding the pool to prevent drainage from the adjacent area entering the pool. The curbing should be given a non-slip finish by floating it off with a wooden float or by giving it an acid wash about 36 to 48 hours after placing. Frequent drains from the walkways surrounding the pool should be connected directly to the sewer to quickly remove water which is carried onto the walks by the bathers.

Projections into the pool, such as ladder rungs or handgrips, should be as few as possible, as they may cause injury to the bathers. Ladders should be recessed into the wall whenever possible. Handgrips, pipe rails, and ropes around the pool are objectionable. A combination scum gutter and handhold such as shown on page 29 should be built into the walls on all sides. This gutter will serve the double purpose of removing any extraneous material which is floating on the surface of the pool, and it offers a handy support to a tired swimmer. Outlets from the scum gutter should be provided about every ten feet and connected directly to the sewer.

Sand Beaches and Grass Plots

The question often arises as to whether the area between the pool and the surrounding fence or bathhouse should be paved or whether it should be a sand beach or grass plot. A sand beach is not recommended, as bathers carry sand into the pool on their suits and feet. In a short time, so much sand or dirt will accumulate that it will make the water cloudy, regardless of the filtration system. The removal of the sand will be an important item of expense in the course of a season.

A grass plot requires constant attention to keep it attractive. Bathers carry newly mown grass into the pool on their feet, making the bottom of the pool unsightly. If beaches of this kind are provided, they should be outside the pool enclosure, and bathers re-entering the pool should first be required to take a thorough shower bath.

A concrete pavement around the pool is more sanitary and in the long run is more satisfactory than either sand or grass. An adequate number of benches around the enclosure will provide comfortable places for swimmers to rest. Sun umbrellas in warmer climates will not only lend a pleasing touch of color to the scene but will provide a bit of welcome shade.

Amusement Equipment

Many bathers are attracted to the swimming pool by the springboards and diving platforms. For many, swimming is secondary to diving, serving only as a means of getting out of the water. A standard diving board will be found more satisfactory and economical than a makeshift board. Furthermore, if diving contests are held under standard regulations, the board must be constructed in accordance with the specifications of the National Collegiate Athletic Association.

Diving platforms placed at the regulation heights,

Photo from Crouse-Hinds Co.

An example of well-designed floodlighting. Night bathing is safe in this pool, where every portion of the underwater area is plainly visible.

provided a sufficient depth of water is available, will be very popular among the better divers.

Springboards and diving platforms should be covered with cocoa fibre matting to prevent slipping. This material, being loosely woven, dries out readily and thus preserves the board. If spare boards are kept on hand, they may be changed from time to time, permitting them to be revarnished and covered, which will greatly prolong their lives.

Chutes or slides also add much to the attraction of the pool. Properly constructed, they are quite safe and furnish a real thrill. In small pools, a chute or slide would be impractical, but, where there is sufficient space, they contribute greatly to the popularity of the pool.

The majority of time spent in the water is devoted to play rather than to actual swimming, so that play equipment, such as inflated rubber horses, frogs, and fish, will be found very useful and comparatively inexpensive.

Policing and Lifeguards

The safety of bathers is paramount, and the surest way of attaining a perfect safety record is to have an adequate number of lifeguards and attendants on duty at all times. The lifeguards must be thoroughly trained in rescue work and resuscitation. A good swimmer is not necessarily a good lifeguard.

Restrictions should not be carried to the point where the patron is kept from having a good time, providing he is not endangering either his own safety or that of others. Playing tag or chasing one another around the pool should not be permitted, as a serious accident may result from a fall on the walk or edge of the pool. Inexperienced divers should not be allowed to dive from platforms more than ten feet high, and divers should be warned by a conspicuously posted sign to be careful to avoid striking swimmers when diving.

The supervisors of swimming pools open to the public, whether they are city park officials or private individuals, are responsible for the prevention of accidents in the pools. Accidents may be prevented by proper design of the pool, by the enforcement of safety regulations, and by the supervision of capable lifeguards.

BATHHOUSES

In connection with an outdoor pool, a bathhouse must be provided to house the offices, dressing rooms, lockers, showers, toilets, laundry, refreshment stand, and other accessories. The structure should be planned to fit in well with the architectural plan of the pool and its surroundings.

Photo from Electrical Products Corp.

The private pool belonging to Henry de Roulet, Los Angeles, is equipped with underwater Neon tube lights, which create a very striking effect at night.

Construction

Concrete is especially well suited to the construction of bathhouses, since they are continually exposed to moisture during the swimming season. Bathhouses, when properly constructed of reinforced concrete or concrete masonry units, require practically no maintenance; depreciation charges are negligible; they are easily kept clean and sanitary; and they receive minimum insurance rates.

Capacity

The capacity of the bathhouse must be such as to avoid crowding at times of maximum demand. If people are forced to stand in line on hot days when they are especially anxious to get into the water, the popularity of the pool will be considerably reduced.

The space required will be largely dependent upon the system adopted. Individual dressing rooms, in which the bather's clothing is left while he is in the pool, require the maximum amount of space and are rarely used for public pools where large crowds are expected. Dressing rooms in which the clothing is changed but not stored, together with steel lockers to store the street clothes while the patron is in the pool, are much more economical of space, since the dressing room is in use for only a few minutes. One dressing room will be sufficient for about five lockers. Metal lockers keep the clothing in good condition and may be cleaned easily.

Individual dressing rooms must be provided for women and girls, whereas the men and boys will usually dress in the aisles between the rows of lockers. A few individual dressing rooms are sometimes provided in the men's sections.

Wire baskets or ordinary market baskets, as well as cloth bags in which the clothing is placed and checked with an attendant, are frequently used. This system is by far the most economical as to space requirements, cost of construction, and equipment. On the other hand, many patrons object to having their clothing wrinkled in the baskets. The bags are somewhat more satisfactory in this respect, since they are provided with a coat hanger and pockets for shoes.

The system to be used in each case is largely dependent upon local conditions, amount of money available for construction, and the space which may be used for the bathhouse.

Regardless of the system adopted, the dressing and locker rooms should be so arranged as to permit a maximum of sunlight and air. A bright, airy dressing room will do much toward maintaining it in a clean, sanitary condition.

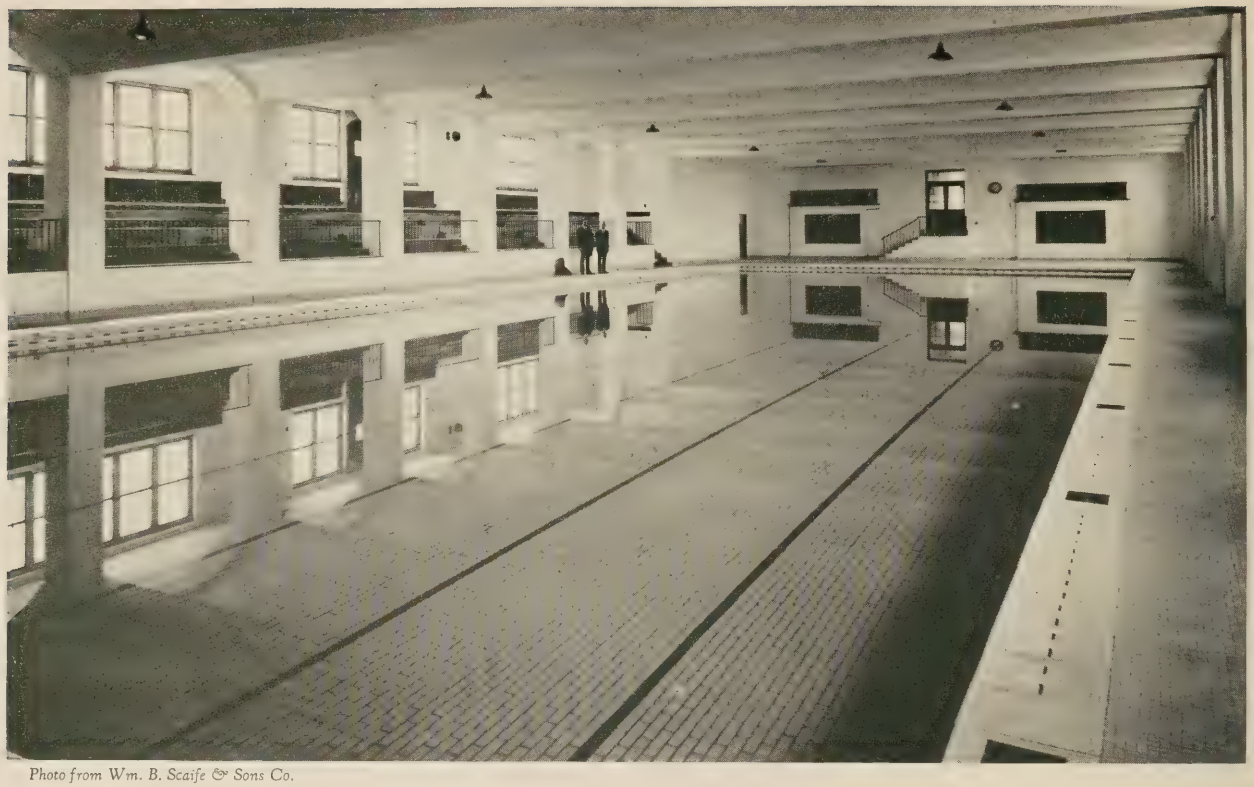


Photo from Wm. B. Scaife & Sons Co.

Clear, pure water such as shown here in the Baltimore City College Pool is possible only with an efficient purification system.

Arrangement

The arrangement of the bathhouse will depend on the shape and size of the pool and on the space and money available for construction. A popular plan is one shown on pages 16 and 17. The cashier's office, suit and towel rooms, and the check room for valuables are grouped in the center of the building. The wings at either end of the building house the lockers, dressing rooms, toilets, and showers, those for men being located on one side and those for women on the opposite side of the lobby. Where the entrance is located at the end of the pool and the number of patrons requires it, the wings housing the dressing rooms may extend around three sides of the pool. In such cases, the showers and toilets may be located at the end opposite the entrance, thus enclosing the whole pool.

The arrangement of bathhouse facilities should be such that patrons can pass through quickly without confusion. At the same time, sanitary and healthful conditions should be assured.

The exits from the locker rooms to the pool should be arranged so that everyone must pass through a shower bath. Each patron should be required to take a shower, thoroughly cleansing with soap, before putting on a bathing suit. By arranging the exit so that each bather must pass through a shower before entering the pool, at least a superficial bath will be obtained. The attendant at the exit of the bathhouse to the pool should inspect each person before allowing him to enter the pool, and anyone apparently diseased should not be permitted to enter the water.

The exit from the bathhouse to the street should be through a turnstile, so arranged that an attendant may collect all keys, checks, suits or other supplies belonging to the establishment.

There are many kinds of bathhouse equipment on the market which add greatly to the convenience of the patrons and increase the popularity of the pool. A foot washer or shower which washes the feet and ankles by means of a spray turned on automatically when the foot is placed on the rest is indispensable to a thoroughly sanitary pool. The hair dryer will be greatly appreciated by the women bathers. Comb vending machines, exercisers, and scales are frequently installed by the most up-to-date pool operators.

PUBLIC INDOOR POOLS

Indoor pools for public or semi-public use are especially desirable, since they may be enjoyed throughout

Cinder concrete block walls and a sound absorbent material covering the ceiling of the swimming pool room of the Y. W. C. A. in Detroit, Michigan, reduce reverberation to a minimum.

the year. Adequate transportation and a central location are even more important in the case of indoor pools than for those situated out-of-doors in public parks where there may be other attractions.

The construction of public indoor pools does not differ materially from those intended for private or club use, except as to size. Due to the greater peak loads in such pools, and since they will be used by little children as well as expert swimmers, a somewhat larger area must be provided for non-swimmers than is customary for private pools. Special features to be considered when building an indoor pool are discussed on pages 18 to 20.

COMMERCIAL POOLS

The general considerations as to the necessity, location and type of pool to be used for commercial purposes are essentially the same as for public pools. Frequently, an indoor pool which can be used throughout the year will be more desirable from an investment standpoint than an outdoor pool. On the other hand, outdoor commercial pools have almost without exception paid excellent dividends on the investment, amounting to as much as 50 per cent per annum in some cases.

Location and Size

A location must, of course, be chosen where the land value will not be prohibitive, but, at the same time, a site in a well-populated district is desirable. Such property is usually fairly high priced, but the greater attendance secured in such location will more than offset the added cost of the land. It must be borne in mind that the majority of the patrons will be boys and girls of school age and little children accompanied by their mothers. A pool within walking distance of their homes will be well patronized.

In determining the size of a commercial pool, care must be taken to provide adequate space to prevent crowding. As in the case of outdoor pools, however, it must not be so large as to appear poorly patronized. By a careful analysis of the location and by comparison with pools in other parts of the city or in other cities, it will be possible to tell quite accurately the size of pool which will be required, based on the average attendance as well as the maximum holiday crowds.

Investment and Fees

Commercially operated pools throughout the country have been remarkably successful from an investment standpoint. This is true not only of indoor pools

An abundance of sunlight from the arched skylight makes a place of enchantment of the private pool of Alex Uhrig, Oconomowoc, Wisconsin.

which are open the entire year but of outdoor pools which operate only three or four months of the year. Management plays an important part in the success of swimming pool operation. Attractive surroundings and a clean, sanitary pool will attract and hold a large patronage.

The customary fees charged at pools operated for profit vary quite widely, depending upon the location and the type of patrons. A large pool can be operated at an excellent profit on much smaller fees than a small one. Estimates of anticipated attendance and a careful study of operating expenses will serve as a guide in determining the proper fees to charge. The scale of fees should obviously be such as to attract people to the pool and at the same time provide an adequate return on the investment. The following schedule is fairly representative of the rates usually charged:

Kid Day: Mondays, Wednesdays and Saturdays, 10 a. m. to 12 Noon	$ 0.10
Children, 14 years and under, on all other days	.15
Adults, with own suit and towel	.25
Towel	$ 0.05
Company suits and towels	.50
Children's season tickets: 16 years and under	5.00
Family tickets: Parents with children under 16 years	12.00
Adult season tickets	7.00

The season ticket rates are based on a season of about 3 months in length.

POOLS FOR PRIVATE ESTATES

Swimming pools on country estates are becoming more and more an essential part of the regular equipment. The estate owner can appreciate readily the value of its triple function: swimming in summer, skating in winter, and a handy body of water serving as fire protection. When water is scarce or at a premium, the ready supply in the pool in the event of fire gives an assurance of safety to the owner who is far removed from the fire plug. The investment is an assurance of healthful recreation in summer and winter,

This entrancing part of a private estate in East Portchester, Connecticut, provides diversion, sport, and healthful exercise for owner and guests.

and is in itself a sufficient asset to recommend an outdoor pool as an actual necessity.

Nothing is more invigorating after a cross-country ride, a round of golf, or for that matter any exercise, than a plunge into one's private pool, its crystal pure water shimmering in the sunlight or aglow from its underwater lights.

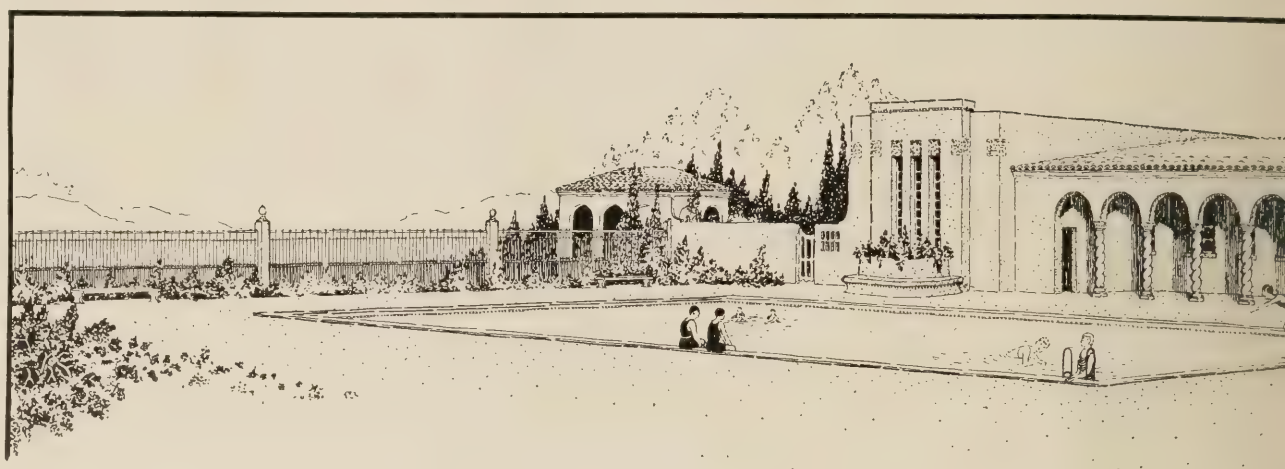
It is advisable that the pool be unobtrusive and at the same time harmonize with the prevailing landscape and general architectural treatment. Generally, it is undesirable to have the pool too near the house. If located at any great distance from the residence, it may be necessary to provide dressing rooms near the pool.

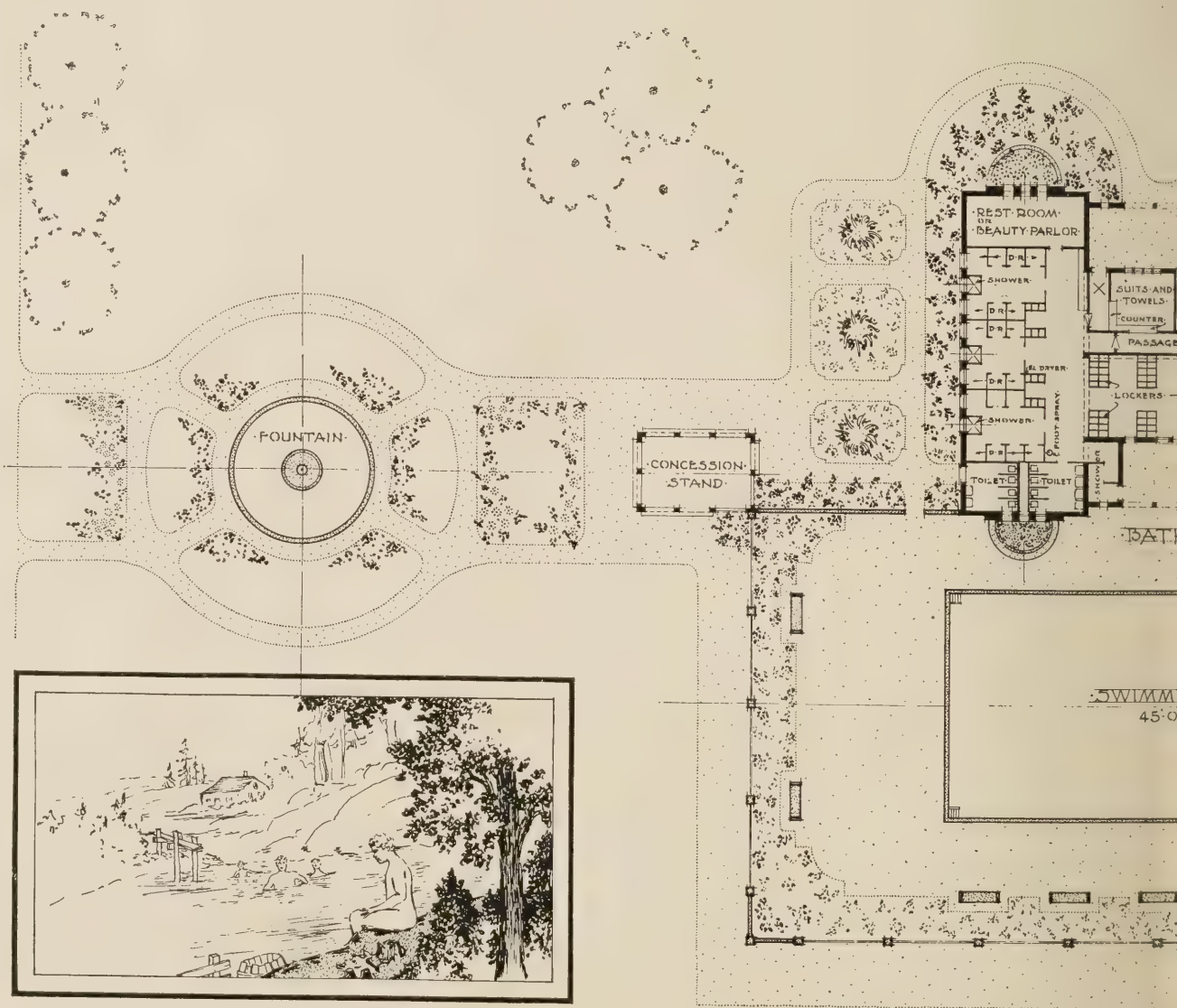
A beautiful indoor pool will be a source of pride to every owner and will be a favorite spot among weekend guests. The lure of a well-designed pool, lined with beautiful faience tile and placed in a palm-filled room, cannot be described. The attractiveness of the setting may be enhanced by the use of cast stone walls and a tastefully ornamented concrete-beamed ceiling. Such an investment will give the estate owner large returns in enjoyment and in healthful exercise.

COUNTRY CLUB POOLS

Swimming is a social pleasure which urges the installation of a pool for every country club. Every argument in favor of pools on private estates is even more pertinent for the country club. Such a pool should have attractive surroundings, perhaps having an enclosure of shrubs or an artistic wall to screen it from observation of those not swimming. The landscape architect may choose to locate it so that a distant view of the water may be had through the branches of the surrounding trees, which cast a welcome shade over a corner of the pool.

The appeal of such a luring addition to the country club may be enhanced by the use of underwater lighting, casting an iridescent light through the water. An illuminated fountain, playing a spray of pure water into the pool, contributes much to the beauty of the scene, as well as being a visible indication that fresh water is entering the pool at all times.

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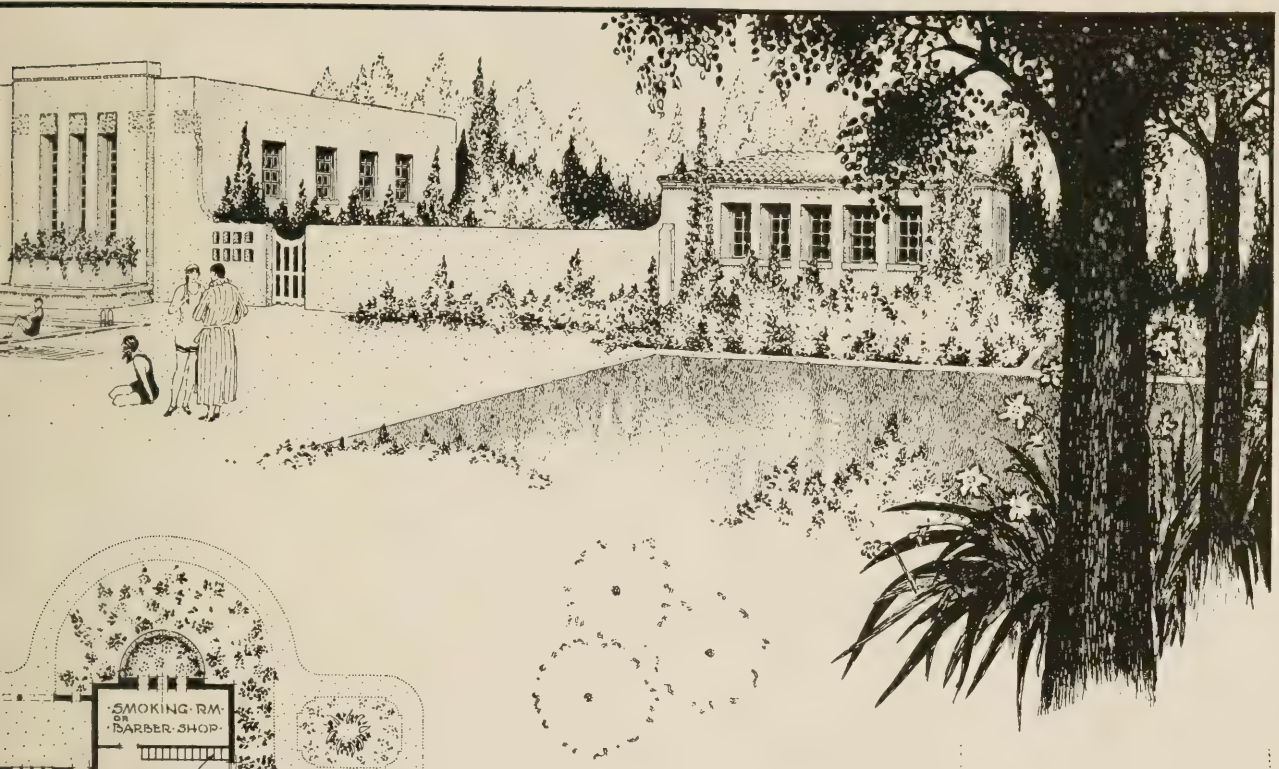
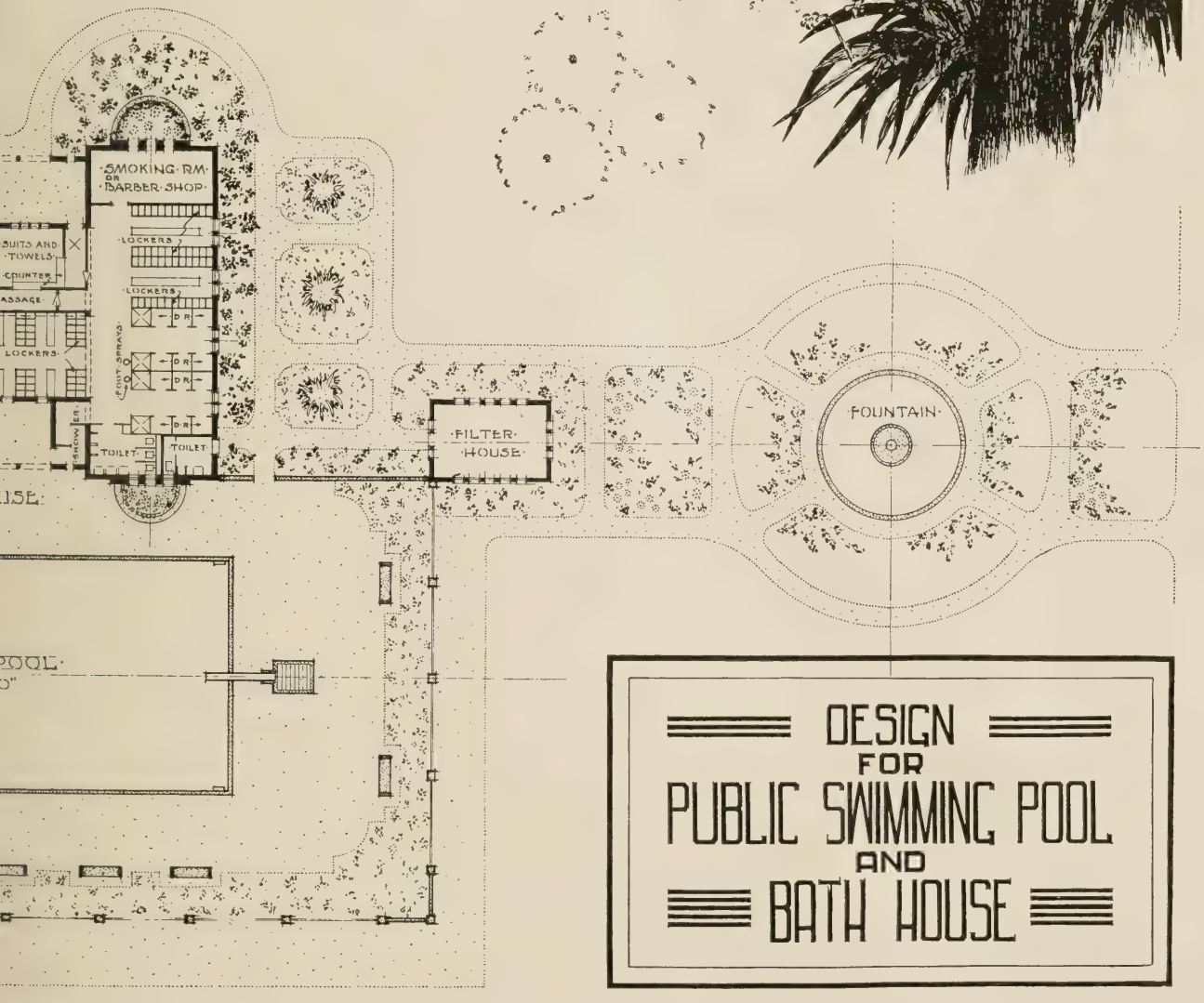
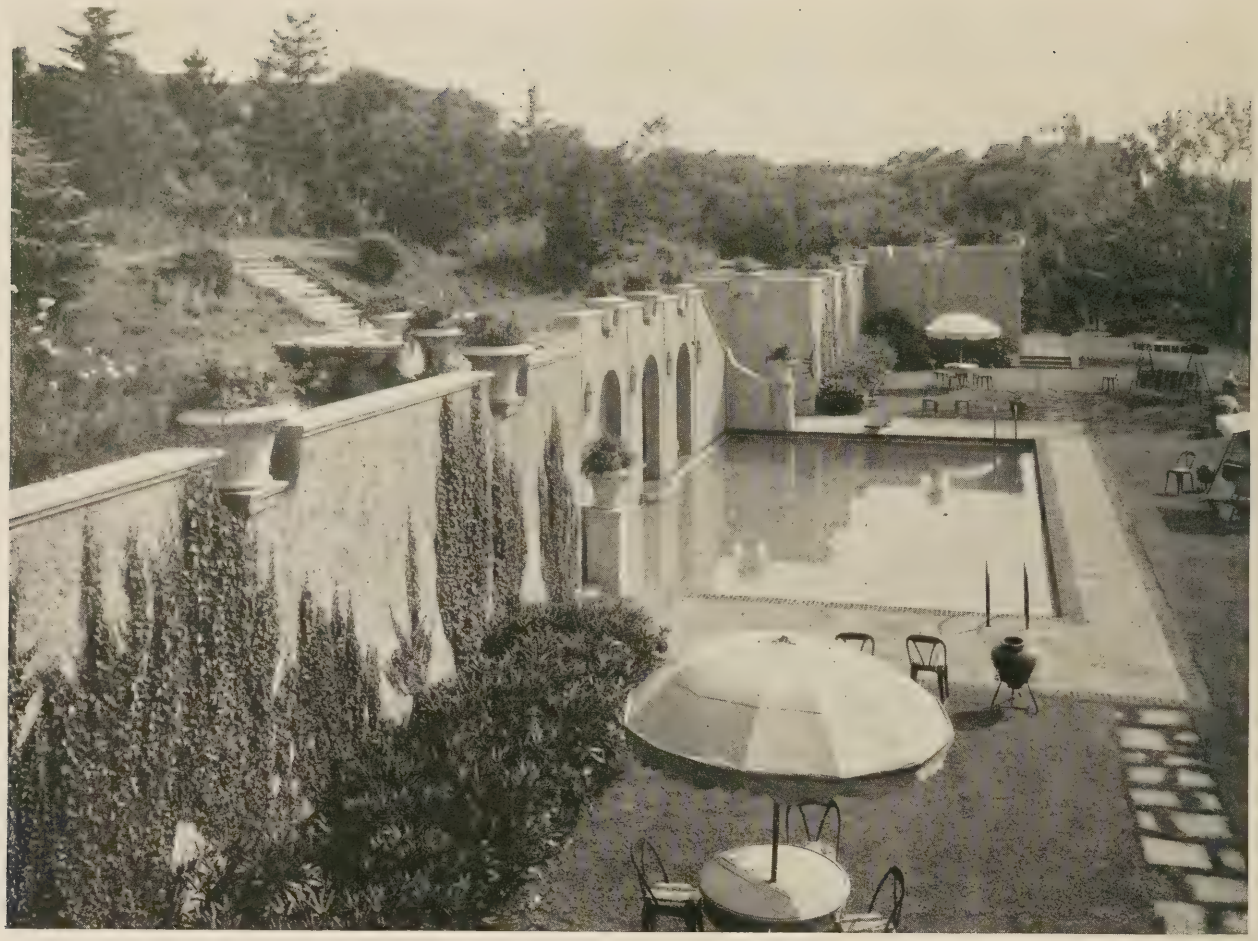




DESIGN FOR PUBLIC SWIMMING POOL AND BATH HOUSE



This pool by the garden wall is a beautiful feature of a private estate in the vicinity of New York City.

The country club is primarily a place of relaxation and pleasure and its facilities are especially delightful during the summer season. The addition of a swimming pool will increase the popularity of a country club and make the summer heat more endurable to the members. The exhilarating effect of a cool plunge, after working under high pressure through a hot day at the office, will soothe both body and nerves, revitalizing one for the activities of the evening or the coming day.

INDOOR POOLS

Schools, clubs, individuals, hotels, and many swimming pool companies build indoor pools, particularly in northern parts of the country, in order that they may be used throughout the year.

In the construction of such pools, the question of location in the building is the first consideration. Basement locations are the most frequent because of the economy of construction, but are by far the least desirable from the standpoints of aesthetics, enjoyment, and the therapeutic value of the sport. Top floor locations or the ground floor in a wing of the building, where sunlight may enter the pool from windows and skylights, are much more to be preferred.

Construction

When the pool is situated in the upper floors of a building, the weight to be supported by the structural frame is necessarily increased. Under such conditions, special precautions should be taken to guard against the possibility of moisture damaging the floors below, due to structural defects or condensation. This is accomplished by means of a light steel pan under the concrete tank or by placing the reinforced concrete, which forms the floor and walls of the pool, inside a light, welded steel tank. If the nature of the site and the general design of the building will permit the

Simplicity and beautiful landscaping make this private pool at Green Farms, Connecticut, particularly attractive.

construction of the pool in the upper floors of the building rather than in the basement, the returns in satisfaction will more than compensate for the additional expense.

Layout

In all indoor pools, attention must be given in planning so as to provide separate entrances to the enclosure for bathers and the non-bathers, either spectators or those who have not yet put on their bathing suits. This not only avoids inconvenience to the bather and audience, but is a vital sanitary precaution. Bacteria and dirt are carried on the shoes, and, if the bathers use the same walk and passageway as are used by the spectators, much of this contamination is carried into the water.

Condensation and Acoustics

The problem of condensation in the pool room, whether it is above or below ground, is serious, but can be solved by proper attention. The air in the room has a relatively high moisture content which, upon coming in contact with the cold walls or ceiling, will cause condensation. By maintaining the temperature of the air and water as nearly the same as possible, the trouble is minimized, but even then some condensation may be produced. Proper insulation of the walls and ceiling to control the variations in temperature will be very beneficial.

Wall surfaces should be of a material which is not affected by moisture and one which may be easily kept clean. Cast stone, glazed brick, and encaustic or porcelain tile produce serviceable walls and have unlimited decorative possibilities. Sound reverberation, because of the prevalence of sound repelling surfaces, is frequently troublesome. This may be reduced to a great extent by the use of acoustical tile ceilings or by breaking up the ceiling area by means of beams. Beautiful, decorative effects may be produced by

The charm of the estate of Robert Treman, Ithaca, New York, is enhanced by a beautiful outdoor pool.

leaving the concrete ceiling beams exposed and giving them an ornamental treatment.

Dimensions

The dimensions of indoor pools which are likely to be used for competitive races and games must be in accordance with the rules of the National Collegiate Athletic Association. These regulations require that the pool be not less than 20 feet wide by 60 feet long, with at least 7 feet of water at the deep end and 3 feet at the shallow end. In pools of larger size, the width should be in multiples of 5 feet and the length should be 3 times the width.

The same regulations as to quantity of water and area per bather must be observed as in the design of outdoor pools. Indoor pools, because of limited size and because they are seldom used by small children, should have a 100 per cent swimming area. The wading area in which the water is too shallow for swimming may be eliminated. Private pools and those intended for special purposes may, of course, be built to any dimension desired.

POOL LININGS

Concrete

Outdoor pools, except the more elaborate, and many indoor pools use the structural concrete walls and floor without additional lining. In such cases, particular care should be exercised when building the forms to obtain straight, true, and smooth surfaces. An excellent surface can be secured by polishing the concrete with carborundum bricks immediately after the forms are removed. Cement paints can be used to give the pool nearly any desired shade of color. A monolithic finish of white cement as a lining produces a very attractive pool. In any case, a light color should be used for the lining. This is especially important in indoor pools.

Vitreous Brick

A lining of light colored vitreous brick is comparatively inexpensive and makes an easily cleaned surface which is durable and pleasing in appearance. In pools lined with light colored materials, bathers

Photo from Graver Corp.

A pool having an irregular outline such as this one on a private estate in Columbus, Ohio, may be readily adapted to a landscaping plan.

can more readily be seen when under water and thus a swimmer in trouble may be easily detected and rescued.

Tile

White ceramic tile is very commonly and satisfactorily used for pool linings. Colored tile in a wide range is available also. The more luxurious pools may be lined with hand-made faience tiles of rich and variegated colorings.

When tile or brick linings are to be used, the concrete should be roughened to obtain a good mechanical bond for the mortar in which the lining material is set. By lining the forms with a heavy coarse mesh burlap which is stripped from the walls after the forms are removed, the surface of the concrete will be left rough. In an outdoor pool lined with brick or tile, the greatest care must be exercised to prevent water from getting between the concrete and the lining. The disruptive effect of frost would otherwise break the bond between the lining and the structural walls, thus entailing considerable expense in repairs.

Details and Markings

The scum gutter with combined handrail, the coping and parapet, and the ladders are readily formed in the concrete, producing a monolithic pool. Special brick and tile are available for constructing these details in lined pools. Coping tile should have a non-slip, "oatmeal," or other rough surface. Contrasting colored tiles or brick are used to indicate swimming lanes, markings for water polo and other games, as well as distance and depth markings. In unlined pools, all such markings should be plainly indicated with waterproof black paint.

LIGHTING

A good lighting system adds much to the attractiveness of a pool and increases its hours of usefulness. Commercial pool operators frequently find the evening

The spacious pool of the Larchmont Sports Club, Westchester County, New York, is beautifully situated among rocks and trees.

hours more profitable than all the rest of the day. Evening is the natural time for recreation among the majority of people. Everyone seeks relaxation and enjoyment after the day's work and a well-lighted pool will prove irresistible.

There are two methods used to illuminate pools. In one system, the lights are placed overhead, illuminating the pool and a portion of the surrounding grounds. In the other, overhead lighting is supplemented by lights placed in the wall below the water line.

Floodlighting

In the overhead system, a number of floodlights are erected on high standards or towers located outside the pool or in some cases within the pool itself. The floodlight consists of an incandescent bulb in a properly designed reflector which concentrates and directs the rays of light. Incandescent globes without reflectors are a waste of illumination and do not give satisfaction, regardless of the number of lights used.

Arc lights are sometimes used for floodlights, but in general they are not as efficient nor as attractive as incandescent globes, since the light produced does not simulate sunlight as well.

If adequate light is to be provided, the projectors must be located properly. The design of a floodlighting system should be made by an expert. The lighting departments of the leading electrical manufacturers will furnish expert advice on the proper illumination of pools.

Underwater Lighting

The lighting of pools from beneath the surface has a strong popular appeal. Many beautiful effects may be produced by the use of diffusing, refracting or colored lenses, or other special lighting equipment. These add greatly to the enjoyment of the bathers and to the aesthetics of the entire setting. The underwater illuminated pool is made especially safe, since every swimmer is continuously in sight of the lifeguard. Confusing shadows are wholly eliminated.

From an hygienic standpoint, underwater lighting is to be recommended very highly, as any defect in the operation of the filter may be quickly detected by the increase in the turbidity of the water. Failure to keep the walls and bottom of the pool in a clean, sanitary condition is at once apparent where the water is illuminated from below the surface.

After a few sets of tennis or a round of golf, a cool plunge is always welcome in the pool at the Troy Country Club, Troy, New York.

Proper underwater lighting of a pool requires the services of a specialist. Complete satisfaction and a full return on the investment required for such an installation can be realized only when it is properly designed and constructed.

SANITATION

Inland streams and many lakes in all parts of the country are polluted by storm sewage and commercial wastes, making the water unsuitable for use for swimming purposes. It is difficult, if not impossible, to rectify this condition. On the other hand, a properly designed and equipped swimming pool is easily kept clean and sanitary—a healthful place of enjoyment.

Public Confidence

Nothing is so abhorrent to the average person as to bathe in contaminated water. Clear, sparkling water and the certain knowledge that the water in a swimming pool is bacteriologically and chemically pure add greatly to the patronage of the pool. Public confidence is readily established by maintaining a clean pool and by posting each day in a conspicuous place a certificate of a competent bacteriologist, testifying to the purity of the water.

Sanitary Engineering Problem

The construction, location, and operation of a modern swimming pool is a sanitary engineering problem. By following the well-established recommendations of the American Association for Promoting Hygiene in Public Baths, and by entrusting the operation of the pool to one familiar with the use of water-purifying equipment, the problem of maintaining a clean, sanitary pool will be solved.

A swimming pool, whether indoors or outdoors, is not just a tank to hold a certain amount of water. It is intended as a place for healthful recreation and to be such the water supply must be guarded with scrupulous care. This is readily accomplished by means of recirculation, filtration, and germicidal treatment to destroy any bacteria remaining after filtration.

"Fill and Draw" System

Filtration of the water supply is not only imperative for the protection of bathers against water-borne

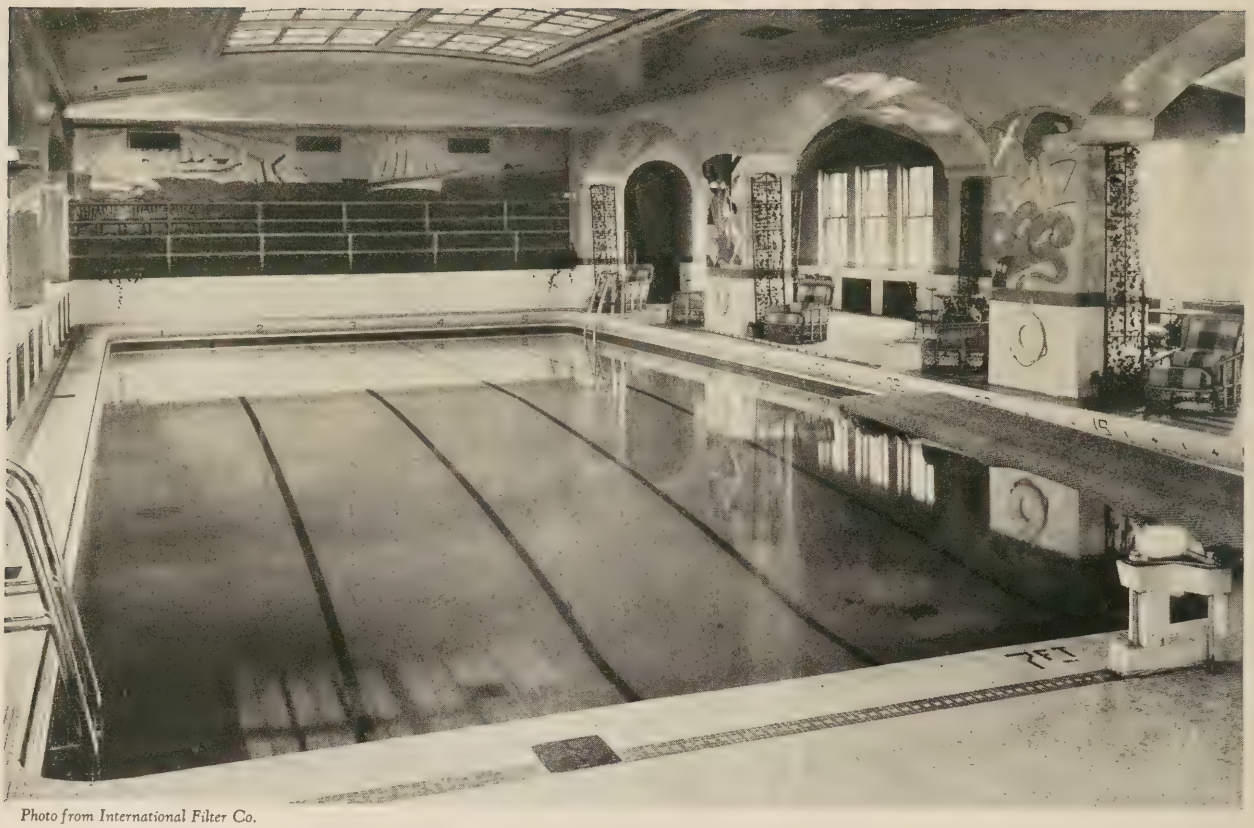


Photo from International Filter Co.

The Illinois Women's Athletic Club, Chicago, is proud of its pool, which is located on the top floor of the club building.

diseases but is usually desirable from an economic consideration. The old "fill and draw" method of pool operation is extremely expensive, and in many locations is prohibitive, due to the cost of water. The cost of heating a fresh supply of water to a satisfactory temperature for bathing, especially in the spring and fall, is an item of considerable expense. Pools operated for profit frequently lose considerable revenue by this antiquated system, as a pool containing several hundred thousand or million gallons of water requires many hours to empty and refill.

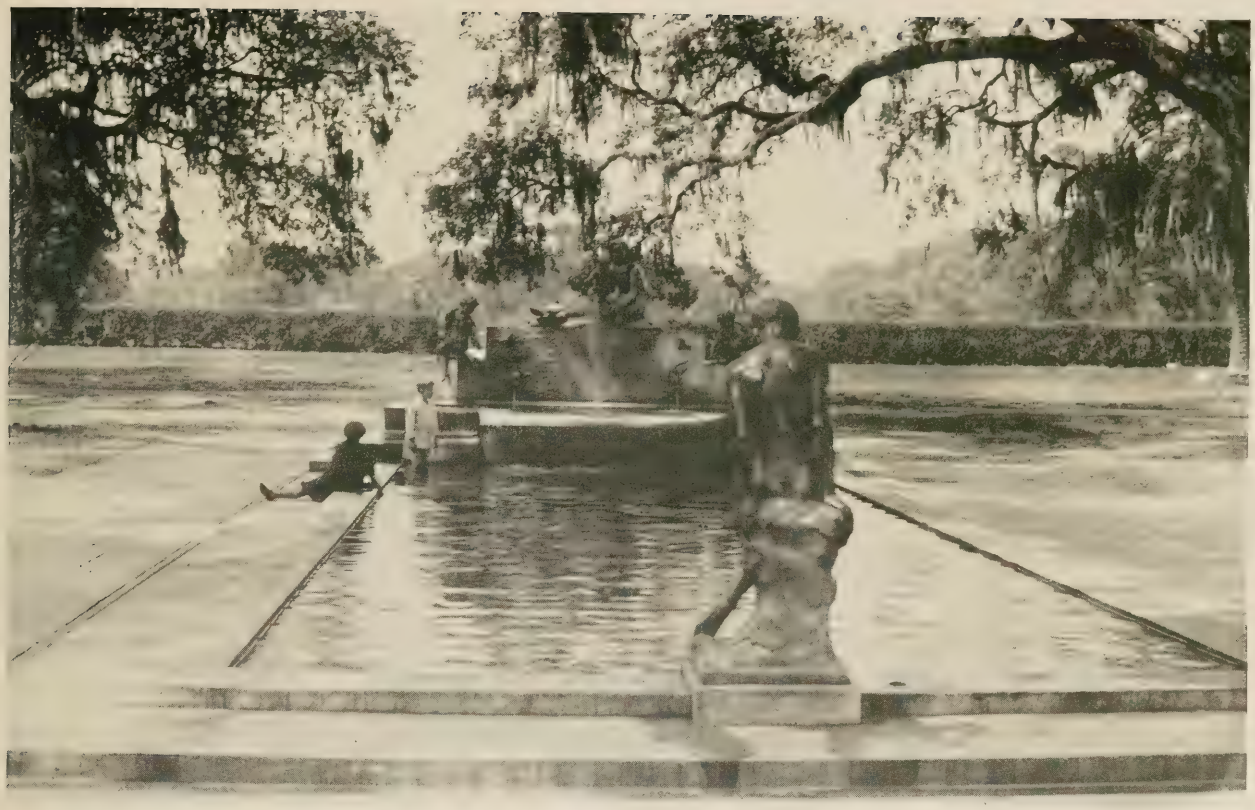
Unless a supply of water is available which is suitable for drinking purposes, and of sufficient quantity to maintain it that way at all times, then the "fill and draw" system should not be used. There is always a tendency under this system to leave the water in the pool too long, allowing it to become dangerously contaminated.

Filtration

Filtration removes from the water all suspended matter and a portion of the bacteria. There are several types of filters in use for the purification of water in swimming pools. The most common is the pressure filter. This type occupies a comparatively small space, is relatively simple to operate, and gives excellent results. When filtration is employed, the water in the pool is continually drawn off, passes through the filter and is then returned to the pool. In this recirculation of the water, there is no building up of pollution such as may occur with the "fill and draw" system or an intermittent system of purification.

Pumping equipment and filters should be designed to handle and purify the entire contents of the pool in not more than eight hours. The capacity of a pressure filter depends on the rate of filtration and the area of the bed. A rate of filtration of more than three gallons per minute should be avoided wherever possible, as a less satisfactory water is produced than at a somewhat slower rate.

By filtering the water, a very small amount of fresh water need be added, as the only loss is by evaporation and the small amount which gets into the scum gutter. A minimum amount of heat is required to keep the water at proper temperature, since the only loss is by radiation.



This wading pool, in its semi-tropical setting in City Park, New Orleans, was the gift of Sara Lavinia Hyams to the children of that city.

Filter Equipment Accessories

Hair catchers are provided with the pressure filter equipment to remove hair, lint, and such material before the water passes on to the filter.

Suction cleaner connections should always be provided in the pool walls. These cleaners are operated by the water circulating pump and are the only practical means for the removal of dirt, hair and sediment of all kinds which collect on the bottom of the pool.

In northern climates, water heaters are used as a part of the recirculation system. This equipment quickly pays for itself by lengthening the bathing season and by increasing the patronage of the pool because of the added comfort of the bathers. For indoor pools, some method of heating the water is essential in order to reduce condensation and temper the water in winter.

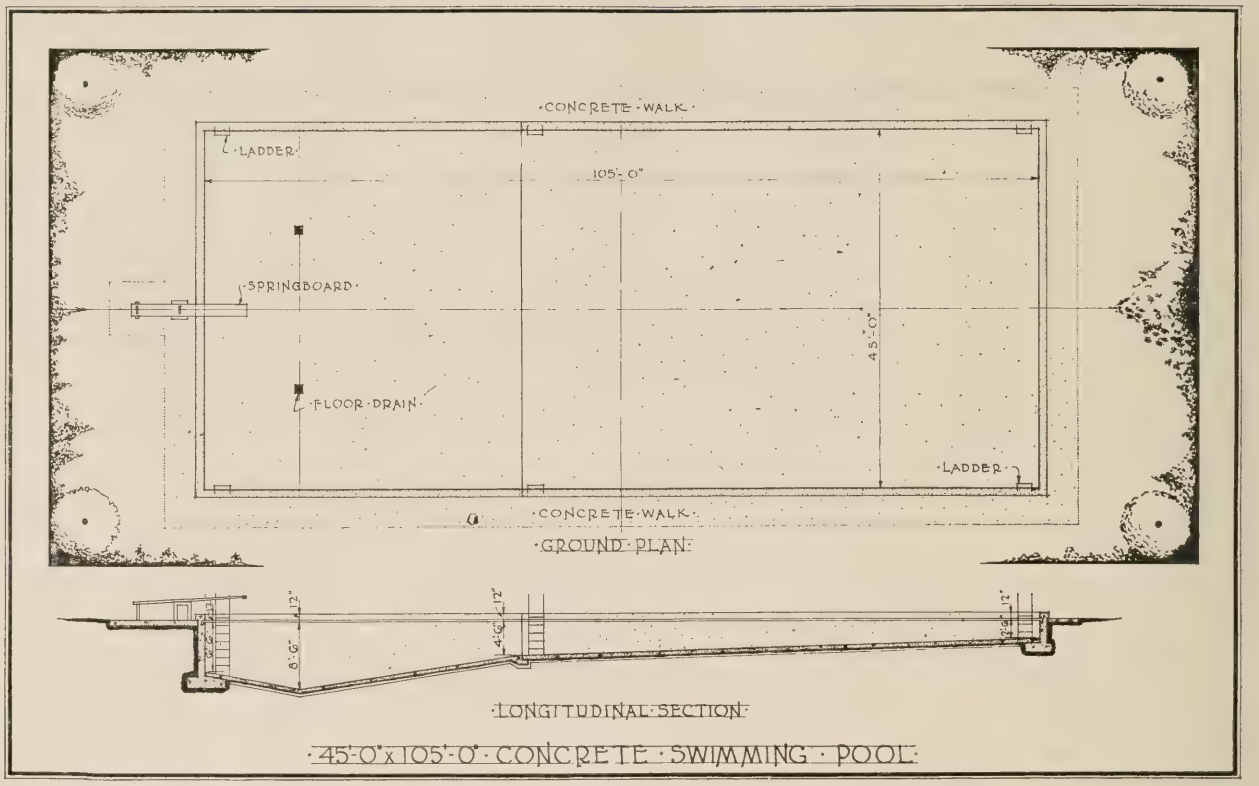
Sterilization of Water

The filtration process returns the water to the pool in a clear, sparkling condition, free from turbidity and suspended matter, as well as a portion of the original bacteria content. In order to have a sterile water, free from all disease-producing bacteria, a germicidal treatment of the water is necessary in addition to filtration. The method of treatment adopted will depend upon local conditions, cost, and personal preference.

Chlorination

Several methods are in common use, namely, chlorine application, ultra violet light, and ozone treatment. Chlorine treatment is very popular because of its simplicity, cheapness, and efficiency. Bleaching powder or liquid chlorine is used in the process and is fed into the water supply at a rate proportionate to the flow. When bleaching powder is used, about 1½ pounds per 100,000 gallons of water are required daily. The use of hypochlorite or bleaching powder is often objectionable in that it is quite difficult to regulate the amount being fed into the water.

The use of liquid chlorine is much to be preferred. An automatic apparatus feeds an accurately measured quantity of the chlorine into the water supply, thus



assuring perfect sterilization. Approximately ½ pound of the pure chlorine will be required per 100,000 gallons of water daily. Free chlorine must be present in the water at all times to insure immediate sterilization of any bacteria entering the pool, but care must be exercised to avoid a sufficient concentration to irritate the eyes and noses of bathers.

Ozone Treatment

Ozone, a gas produced by the action of an electric arc on air, is effective for the sterilization of swimming pool water and has a popular appeal. Ozone is a strong, oxidizing agent which destroys bacteria and organic matter by literally burning it up. The ozone is not irritating and, if any odor is detectable, it is more pleasing than objectionable.

Ultra Violet Ray Treatment

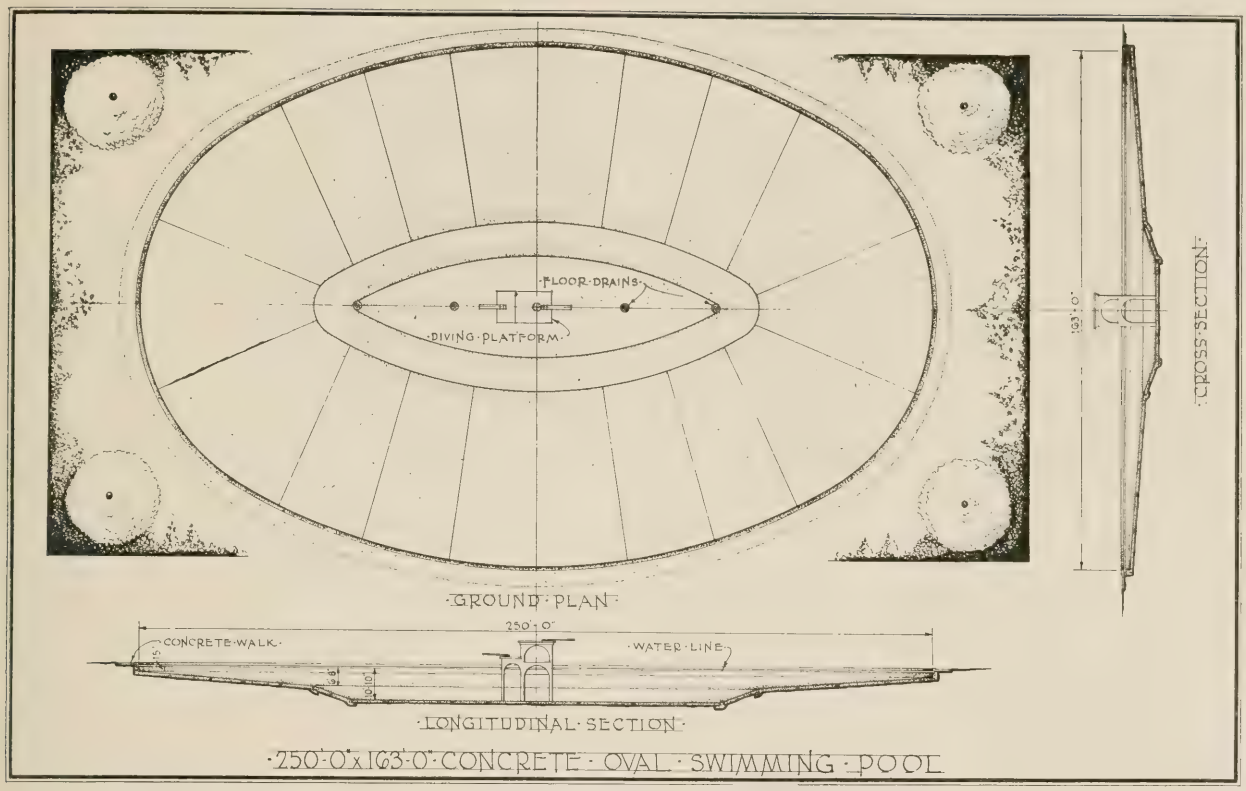
The ultra violet ray treatment consists of passing the water in a thin film around a mercury lamp generating the ultra violet rays. This method of sterilization is effective so long as the water being treated is free from suspended matter and turbidity. The sterilizer may be placed where the patrons of the pool may see it in operation, which has a favorable psychological effect.

Elimination of Algae

The use of copper sulphate is not recommended as a sterilizing agent but it is very effective as an algaecide in treating the water supply for outdoor pools. Algae grow very readily in certain water, tending to form a green scum on the surface of the water and on the walls of the pool. About ½ pound of the copper sulphate per 100,000 gallons of water used two or three times a week will usually be sufficient to control such growths. If a growth has been allowed to accumulate on the walls, the water should be lowered or drained, leaving the algae scum exposed. The walls may then be sprayed with a five per cent solution of the copper sulphate and scrubbed down with a wire brush.

Construction Features

The design and construction of a swimming pool should be such that the pool and its surroundings may readily be cleaned. The scum gutter extending completely around the pool should be so designed as to be easily cleaned. It should be provided with connections to the sewer at frequent intervals to quickly carry away all impurities which find their way into it.



Drainage from walkways around the pool should be conducted directly to the sewer and not into the scum gutter, as it is possible that some contamination will be washed out of the gutter by the splash and thereby enter the pool.

Spectators' galleries or pavilions must be kept back a sufficient distance from the pool to make it impossible to expectorate into the water or to drop things into the pool.

Personal Regulations

The recommendations applying to the bathers adopted by the American Association for Promoting Hygiene in Public Baths should be strictly enforced. Everyone entering the pool should be required to take a soap bath before putting on a bathing suit. The use of conspicuous signs calling the bathers' attention to the sanitary regulations will aid materially in securing cooperation.

WINTER PROTECTION

Outdoor pools in a northern climate can be made to yield additional dividends in cash or pleasure by utilizing them for skating rinks during the winter months. Properly designed concrete pools will not be injured by such use. This is particularly true of pools over twenty feet wide, as in these cases the ice will bulge upward slightly, due to the pressure of the displaced water below. This relieves any serious outward pressure against the walls.

The water level in the pool should be lowered about a foot below the scum gutter to avoid any possible damage to the lip of the gutter. If this precaution is taken, no trouble should be experienced. Certain pools have been frozen over repeatedly, the ice in some cases reaching a thickness of 18 inches, without damaging the pool.

If it is not desired to use the pool during the winter months, it should be drained and left empty. If the concrete mixture has been properly designed and placed, no damage will result. Before the pool is filled the following summer, an inspection of the bituminous filler in expansion joints should be made to be sure that the joints are watertight.

COST

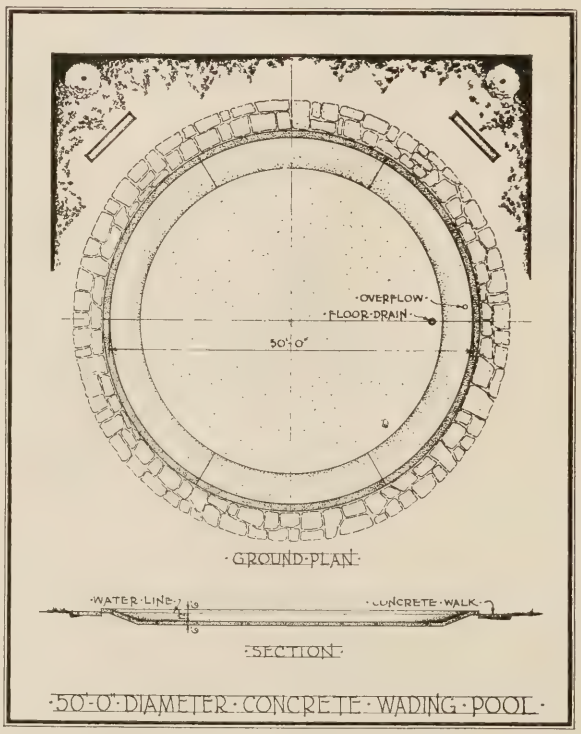
The cost of a concrete swimming pool is determined by the size of the pool, by its design, and by local prices of labor and material. Only after a

The children of Park Ridge, Illinois, were not forgotten by the officials who built this wading pool.

tentative design has been selected can a reliable estimate of cost be prepared by the architect, the engineer who made the design, or by a local contractor.

WADING POOLS

Many outdoor swimming pools, especially those which are planned with a view to public or semi-public use, are so designed as to include a section to be used as a wading pool. However, the depth of water at the shallow end of such pools is often greater than is safe for small children who cannot swim. Even when the shallow end is of such depth as to be satisfactory for wading, there is always the possible danger of small children venturing too far into deep water, where they are soon in trouble unless help comes quickly. For these reasons, wading pools should preferably be made as independent structures.

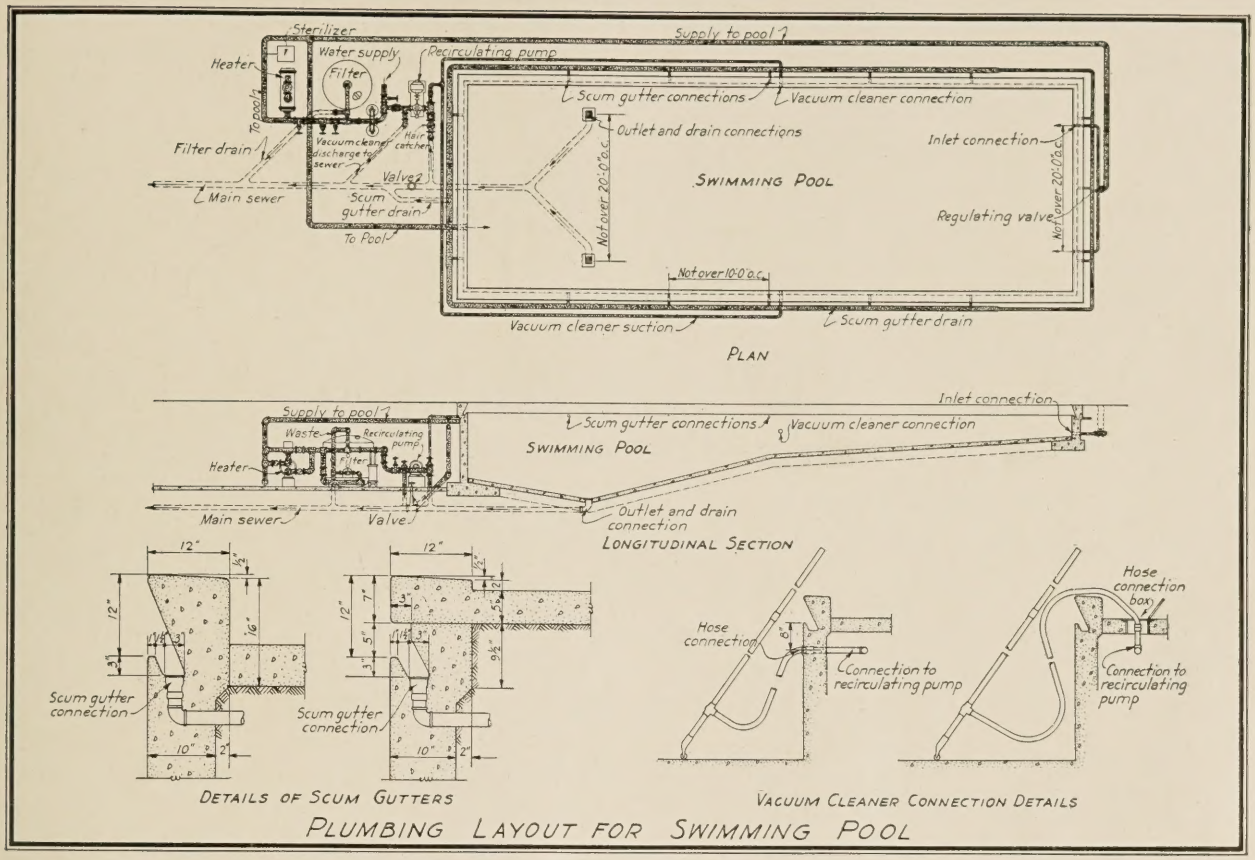


Location

Small areas not suitable for swimming pools can often be utilized for wading pools. School grounds, small city playgrounds, or vacant lots may be used, as well as public parks. Wading pools do not require bathhouses.

A number of small pools well situated over the city will be sources of delight to more children than a few large pools, because of being within easy walking distance of their homes. Dallas, Texas, has a large number of wading pools located in all parts of the city. The majority of these pools are about 30 by 50 feet in plan, although some are considerably larger. Trinidad, Colorado; Vancouver, B. C.; and Chicago each has several pools situated in public parks and playgrounds, where children may wade and race their miniature boats.

An indoor wading pool in connection with a public or commercial swimming pool will be a popular and



valuable adjunct. Parents wishing to use the swimming pool frequently do not do so because they cannot leave the children at home and they hesitate to let them wade in the deep pool. When there is a place provided for the children to play, the parents or older brothers or sisters will make more frequent use of the swimming pool.

Design

A suggested design for a wading pool is shown on page 28. As planned, the maximum depth of water is 12 inches. This depth can be decreased by placing the outlet at a lower elevation. The flat, sloping sides of the pool make it easy to enter without danger of slipping. Wading pools should be designed and built with the same care and attention as given to swimming pools. The specifications for swimming pool construction presented on page 30 apply equally well to wading pools. The size and shape of the pool may be changed to suit local conditions.

Water Supply

Due to the comparatively small quantity of water required for the wading pool, the "fill and draw" system is usually employed. Furthermore, the large amount of sand and grass carried into the pool would be objectionable if drawn into a purification system. A high degree of bacterial purity can be maintained by having a continuous flow through the pool or by drawing off the water each day and thoroughly cleaning the pool before refilling.

Use as Skating Rink

Wading pools, when of sufficient size, are particularly well suited for use as skating rinks on account of the sloping sides. When used for this purpose, the pool will afford pleasure for grown people as well as children. As far as exercise and recreation are concerned, skating in winter may well take the place of swimming in summer. When the wading pool is in connection with a commercial swimming pool, the increased length of the useful season gives the owner a much larger return on the investment.

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SPECIFICATIONS FOR CONCRETE SWIMMING POOLS

NOTE: The following specifications cover the concrete work only. All items of excavating, drainage, plumbing, electric wiring, mechanical installations, and similar types of work should be done in accordance with best recognized practice and recommendations of manufacturers and all local and state laws:

MATERIALS

1. *Portland Cement*

Portland cement shall be of American manufacture and shall conform to the "Standard Specifications and Tests for Portland Cement" (Serial Designation C9-26) of the American Society for Testing Materials, and subsequent revisions thereof.

2. *Fine Aggregate*

Fine aggregate shall consist of sand having clean, hard, durable, uncoated grains, free from deleterious substances.

Fine aggregate shall range in size from fine to coarse within the limits indicated below, percentage by weight:

Passing through No. 4 sieve	100%
Passing through No. 50 sieve	Not more than 30% Not less than 10%
Passing through No. 100 sieve, when screened dry	Not more than 5%
Volume removed by sedimentation	Not more than 3%

3. *Coarse Aggregate*

Coarse aggregate shall consist of crushed stone, gravel, air-cooled blast furnace slag, or other approved inert materials with similar characteristics, or combination thereof, having clean, hard, durable, uncoated particles, free from deleterious matter.

Coarse aggregate shall range in size from fine to coarse within the following percentages, by weight:

Passing a 1″ sieve	Not less than 95%
Passing a ½″ sieve	Not more than 75% Not less than 40%
Passing a No. 4 sieve	Not more than 5%

Bank or pit-run aggregate in its original state shall not be used.

4. *Mixing Water*

Mixing water shall be free from oil, acid, and injurious amounts of vegetable matter, alkalies or other salts.

5. *Steel Reinforcement*

Steel rods or bars used for reinforcing shall be billet-steel of intermediate grade or rail-steel.

Reinforcement bars shall conform to the area and equivalent sizes shown or called for on the general plans or detailed drawings.

PROPORTIONING

6. *General*

The unit of measure shall be the cubic foot. Ninety-four (94) pounds, one (1) sack or one-fourth (¼) barrel of cement shall be assumed as one (1) cubic foot.

7. *Measuring Ingredients*

The method of measurement shall be such as to secure the specified proportions in each batch. The aggregates shall be measured separately by volume or weight. In volume measurement, the fine aggregate and the coarse aggregate shall be measured loose, as thrown into the measuring device, due allowance being made for bulking. The water shall be so measured as to insure the desired quantity in successive batches.

8. *Water-Cement Ratio*

The proportioning of materials shall be based on the requirements for a plastic and workable mix containing not more than six (6) gallons of water per sack (94 pounds) of cement to produce a concrete having a 28-day compressive strength of 3000 pounds per square inch. This quantity of water must not be exceeded. Water in the aggregate must be included in the quantity specified and subtracted from the amount added to the mixture.

9. *Moisture in Aggregate*

Moisture in the aggregate shall be measured by methods satisfactory to the Engineer which will give results within one pound for each 100 pounds of aggregate.

10. *Slump*

The slump shall be within the following limits: minimum, 2 inches; maximum, 5 inches. Slump tests shall be made whenever directed by the Engineer.

11. *Workability*

The mixture shall be such as to produce concrete that can be worked readily into the corners and angles of the forms and around the reinforcement without excessive spading. The workability will be controlled by adding or deducting fine or coarse aggregate, but in no case shall the amount of coarse aggregate be such as to produce harshness in placing or honeycombing in the structure.

That combination of fine and coarse aggregate which will produce the desired workability will vary with the grading of the aggregates, but in no case shall more than one part of fine to one part of coarse be used.

12. *Trial Batches*

Full-sized trial batches shall be made in the mixer, using the aggregates selected for the job to establish the correct proportions of the mix to give proper workability and maintaining the water-cement ratio and slump as specified. An initial trial batch shall be made based on the proportion by dry compact volume of 1-2-3, proper allowance being made for loose measurement and the effect of bulking due to moisture. If the desired workability is not obtained, then the combination of fine and coarse aggregates shall be adjusted within the limits specified until the mix meets with the approval of the Engineer.

MIXING

13. *Machine Mixing*

The mixing of concrete shall be done in a batch mixer of approved type, which will insure a uniform distribution of the materials throughout the mass, so that the mixture is uniform in color and homogeneous. The mixer shall be equipped with suitable charging hopper, water storage, and a water-measuring device controlled from a case which can be kept locked and so constructed that the water can be discharged only while the mixer is being charged. The entire contents of the drum shall be discharged before recharging. The mixer shall be cleaned at frequent intervals while in use. The volume of the mixed material per batch shall not exceed the manufacturer's rated capacity of the mixer.

14. *Time of Mixing*

The mixing of each batch shall continue not less than one minute after all the materials, including the water, are in the mixer.

15. *Hand Mixing*

Hand mixing will not be permitted.

16. *Retempering*

The retempering of concrete which has partially hardened, that is, remixing with or without additional cement, aggregate, or water, will not be permitted.

DEPOSITING CONCRETE

17. *General*

Before depositing any concrete, all debris shall be removed from the space to be occupied by the concrete, all steel re-

inforcing shall be secured in its proper location, all forms shall be thoroughly wetted except in freezing weather, and all form work and steel reinforcing shall be inspected and approved by the Engineer. Forms shall not be oiled.

18. ***Handling and Placing***

Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which shall prevent the separation or loss of the ingredients. It shall be deposited in the forms as nearly as practicable in its final position to avoid rehandling. It shall be so deposited as to maintain, until the completion of the unit, a plastic surface approximately horizontal. The concrete shall be placed in a manner that will avoid accumulation of hardened concrete on the forms or metal reinforcement. Under no circumstances shall concrete that has partially hardened be deposited in the work.

19. ***Compacting***

Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. For thin walls or inaccessible portions of the forms, where rodding or forking is impracticable, the concrete shall be assisted into place by tapping or hammering the forms opposite the freshly deposited concrete. The concrete shall be thoroughly worked around the reinforcement, and around embedded fixtures and into corners of the forms.

20. ***Protecting and Curing***

Exposed surfaces of concrete shall be protected from premature drying by being covered with burlap or sand, which must be kept continually wet by sprinkling or by other methods that may be approved by the Engineer. The damp burlap or sand shall be placed as soon as the concrete is hard enough not to be marred by the process, and the sprinkling must continue for a period of not less than ten days, and, in case the Engineer requires it, for a longer period.

21. ***Temperature***

Concrete when deposited shall have a temperature not below 50° Fahrenheit and not above 120° Fahrenheit. In freezing weather, suitable means shall be provided for maintaining the concrete at a temperature not lower than 50° Fahrenheit, for not less than 72 hours after placing, or until the concrete has thoroughly hardened. The methods of heating the materials and protecting the concrete shall be approved by the Engineer. Salt, chemicals, or other foreign materials shall not be mixed with the concrete for the purpose of preventing freezing.

22. ***Depositing Against Other Concrete***

Before depositing new concrete on or against concrete which has hardened, the forms shall be retightened, the surface of the hardened concrete shall be thoroughly cleaned of foreign matter and laitance, and saturated with water, and shall be roughened as required by the Engineer. The new concrete placed in contact with hardened or partially hardened concrete shall contain an excess of mortar to insure bond. To insure the excess of mortar at the juncture of the hardened and the newly deposited concrete, the cleaned and saturated surfaces of the hardened concrete, including vertical and inclined surfaces, shall first be slushed with a coating of neat cement grout against which the new concrete shall be placed before the grout has attained its initial set.

23. ***Floor Finish***

After the concrete has been brought to the established grade by means of a strikeboard, it shall be floated with a wood float in a manner that will thoroughly compact it and provide a smooth, even surface. The surface shall then be lightly steel troweled. The troweling should be followed with a light brushing with a hair brush to give a non-slip finish.

24. ***Wall Finish***

Immediately after the forms are removed, all projections and irregularities on the exposed surfaces shall be removed and all cavities neatly filled with a 1-1½ portland cement and sand mortar. Plastering of the surface will not be permitted. The surface shall be finished by wetting and thoroughly rubbing with a carborundum brick. The top of the wall should be left gritty to prevent slipping.

FORMS

25. ***General***

Forms shall conform to the shape, lines, and dimensions of the concrete as called for in the plans. Lumber used in the forms for exposed surfaces shall be dressed to a uniform thickness, and shall be free from loose knots or other defects. Joints in forms shall be horizontal or vertical. For unexposed surfaces, rough lumber may be used. Lumber once used in forms should have nails withdrawn, and surfaces to be in contact with concrete thoroughly cleaned before being used again.

METAL REINFORCEMENT

26. ***Cleaning***

Metal reinforcement, before being placed, shall be thoroughly cleaned of mill and rust scale and of coatings that will destroy or reduce the bond. Reinforcement appreciably reduced in section shall be rejected. Where there is delay in depositing concrete, reinforcement shall be reinspected and, when necessary, cleaned.

27. ***Bending***

Reinforcement shall be carefully formed to the dimensions indicated on the plans. Cold bends shall be made around a pin having a diameter of six or more times the least dimension of the reinforcement bars.

28. ***Straightening***

Metal reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown in the plans shall not be used. Heating of reinforcement will be permitted only when the entire operation is approved by the Engineer.

29. ***Placing***

Metal reinforcement shall be accurately positioned and secured against displacement by using annealed iron wire of not less than No. 18 gauge or suitable clips at intersections, and shall be supported by concrete or metal chairs or spacers, or metal hangers, unless otherwise shown on the plans. The minimum clear distance between any bar and the nearest concrete face shall not be less than 2 inches to insure protection against moisture.

Wire mesh used in the floor slab shall be lapped not less than six (6) inches on all sides and securely wired.

Wherever it is necessary to splice bar reinforcement otherwise than as shown in the plans, the character of the splice shall be decided by the Engineer on the basis of safe bond stress and the stress in the reinforcement at the splice.

JOINTS

30. ***Construction Joints***

When necessary to provide construction joints not indicated on the plans, such joints shall be located and formed so as to not impair the strength and to least impair the appearance of the structure. Where conditions require, the joints shall be reinforced as directed by the Engineer in order to secure the necessary bond strength.

31. ***Expansion Joints***

Expansion joints in the floor and walls shall be spaced not over sixty (60) feet apart. The joints shall be filled with an approved tar or asphaltic filler which will not run in hot weather nor become brittle when cold nor be affected adversely by water. The wall joints shall be provided with a crimped copper strip to serve as a water stop.

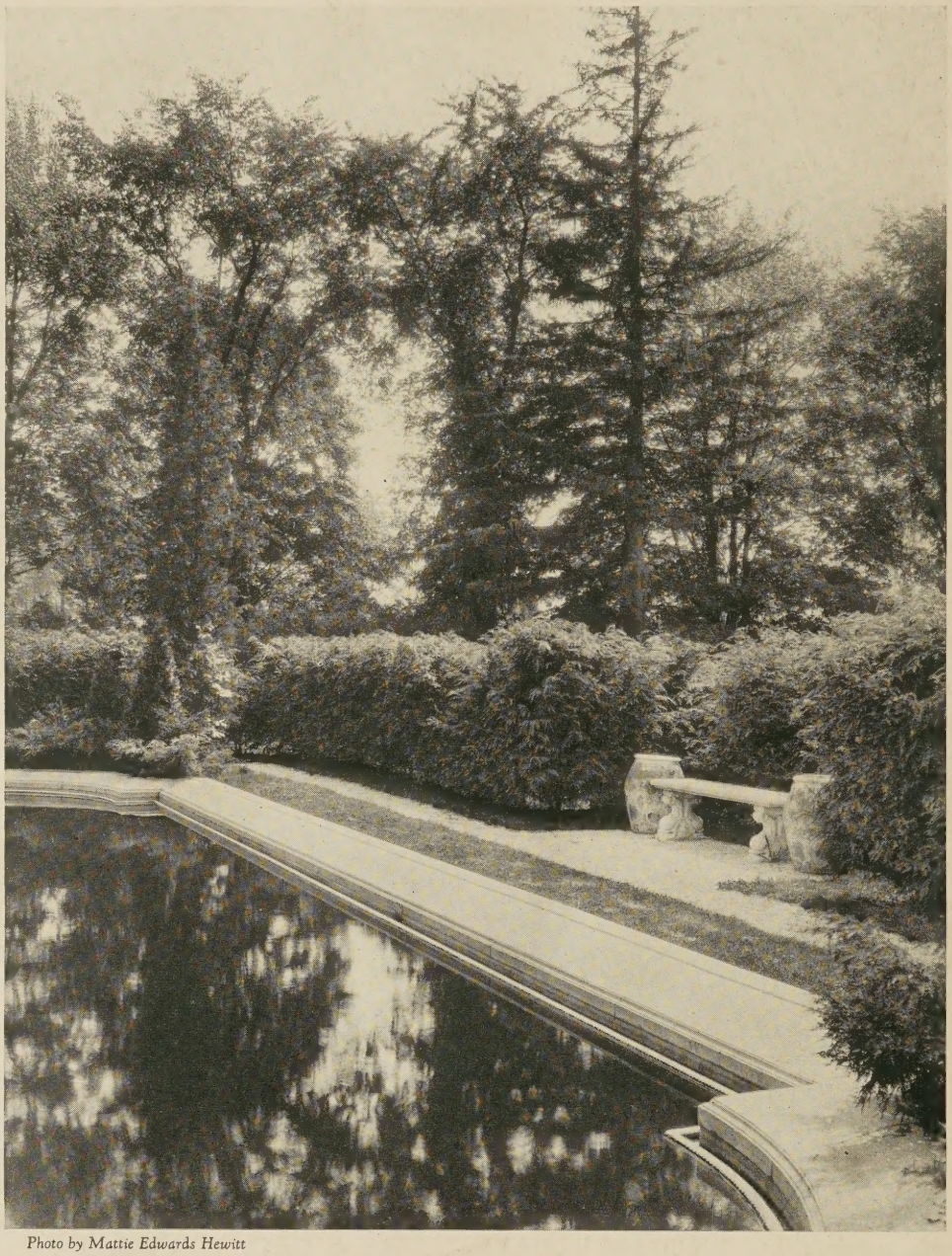

Photo by Mattie Edwards Hewitt

An air of privacy is essential to the private pool. The landscape architect accomplished this most attractively with the high, close hedge surrounding the pool on the Rowland Estate, Rye, New York.

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